MIL-P-60989A (PA)
29 March 1976
SUPERSEDING
MIL-P-60989 (MU)
11 January 1968

MILITARY SPECIFICATION

PROPELLANT, M2

FOR

M5 SUBSYSTEM AMMUNITION

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers one type of propellant designated as Propellant, M2 for M5 Submission Ammunition.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-A-51	- Acetone

MILITARY

MIL-G-155	- Graphite (for use in Ammunition)
MIL-P-156	- Potassium Nitrate
MIL-B-162	- Barium Nitrate
MIL-N-244	- Nitrocellulose (for use in Explosives)
MIL-N-246	- Nitroglycerin
MIL-E-255	- Ethyl Centralite (Carbanite)
MIL-E-463	- Ethyl Alcohol (for Ordnance Use)
MIL-A-48078	- Ammunition, Standard Quality Assurance Provisions, General Specification for

FSC: 1375

STANDARDS

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-286	- Propellants, Solid: Sampling, Examination and Testing
MIL-STD-652	- Propellants Solid for Cannons, Requirements and Packing

DRAWINGS

PICATINNY ARSENAL

8858848	- Marking Diagram and Sealing of Metal Lined Wooden Packing Boxes for Shipment of Propellants

2.2 Other Publications - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

CODE OF FEDERAL REGULATIONS

TITLE 49 - Transportation, Parts 100-199

(The Code of Federal Regulations is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Orders should specify "49 CFR 100-199 (latest revision)").

3. REQUIREMENTS

3.1 Material - The constituent materials shall comply with the requirements of the applicable specifications as follows:

Constituent Materials	Conforming to Specification
Nitrocellulose	MIL-N-244, Grade C, Type 1 or 2
Nitroglycerin	MIL-N-246
Potassium Nitrate	MIL-P-156, Class 2 or 3

Barium Nitrate	MIL-B-162, Class 3
Ethyl Centralite	MIL-E-255
Graphite	MIL-G-155, Grades III or IV
Ethyl Alcohol	MIL-E-463, Grade II
Acetone	O-A-51

3.2 Composition - The composition of the propellant, exclusive of total volatiles and graphite glaze shall be as shown in Table I when determined as specified in the applicable subparagraphs of 4.5.1. After drying, the propellant shall be graphite glazed in addition to the graphite used in making up the basic composition. The maximum graphite content allowed including glaze, shall be 0.60 percent.

TABLE I

INGREDIENT	PERCENTAGE
Nitrocellulose	77.45 ± 2.00
Nitroglycerin	19.50 ± 1.00
Potassium Nitrate	0.75 ± 0.25
Barium Nitrate	1.40 ± 0.25
Ethyl Centralite	0.60 ± 0.15
Graphite	0.30 ± 0.10

3.3 Total Volatiles - The total volatiles shall not exceed 1.70 percent.

3.4 Total Moisture - The moisture content shall not exceed 0.70 percent.

3.5 Stability and Physical Tests -

3.5.1 120 Degrees Centigrade (120°C Heat Test - The propellant shall not cause complete fading of the methyl violet test paper to salmon pink in less than 40 minutes.

3.6 Form of Grain - The grain shall be cylindrical with a single longitudinal perforation through the center of the grain.

3.7 Dimension of Grain - The dimensions of the grain shall be as follows when determined as specified in the applicable subparagraphs of 4.5.5:

Length (L) (ADVISORY)	.055 inch
Diameter (D) (ADIVSORY)	.046 inch
Diameter of perforations (D) ADVISORY	.008 inch
Web thickness (W) (ADVISORY)	.019 inch

3.7.1 Length-diameter Ratio - The average grain length shall be 1.20 nominal times the average grain diameter.

3.7.2 Grain Diameter-perforation Diameter Ratio - The average grain diameter shall be from 5 to 7 times the average perforation-diameter.

3.7.3 Length and Diameter Uniformity - The length and diameter of grain shall comply with the uniformity requirements specified in Military Standard MIL-STD-652.

3.8 Ballistics - The propellant shall be a ballistic match to the current standard lot and shall comply with the following requirement:

3.8.1 Closed Bomb - The propellant shall be a closed bomb quickness match to the current standard lot. A quickness match is defined as a minimum average relative quickness of 97 percent and maximum of 103 percent when fired in a 200cc nominal bomb at a loading density of 0.1 gm/cc.

3.9 Description Sheets - With every lot of propellant submitted for acceptance, the contractor shall furnish on official blanks, 8 copies of a description sheet giving a complete history of its manufacture and chemical and physical analysis.

3.10 Workmanship - The best commercial practices shall be used in the manufacture of propellant furnished under this specification and all other applicable documents. The propellant and its standard ingredients shall be protected from the action of direct sunlight and acid fumes. The propellant shall not contain excessive quantities of cracked, distorted, short and long and otherwise deformed grains.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection and Standard Quality Assurance Provisions - Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of Inspections - The following type of inspection shall be conducted on this item:

a. Quality Conformance Inspection

4.3 First Article Inspection - Not applicable.

4.4 Quality Conformance Inspection -

4.4.1 Inspection Lot Formation - Inspection lots shall comply with the lot formation provisions of MIL-A-48078.

4.4.2 Examination - See MIL-A-48078.

a. Sampling Plans - Unless otherwise specified in the Classification of Defects and Test Tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II.

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-P-60989A (PA)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 8858848
4.4.2.1	Box, Prior to Closing				NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Foreign matter in interior		0.40%	3.2	Visual
102	Crack or hole in metal liner (as applicable)		0.40%	3.2	Visual

NOTES:

SARPA-QA FORM 2567 FEB 74 4010

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-P-60989A (PA)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 8858848
4.4.2.2	Sealed Box				NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Cover improperly closed		0.40%	3.2	Visual/Manual
102	Wooden cover split or otherwise damaged		0.40%	3.2	Visual
103	Gasket missing or broken		0.40%	3.2	Visual
Minor					
201	Crack or hole		0.65%	3.2	Visual
202	Hardware improperly engaged		0.65%	3.2	Visual
203	Marking misleading or unidentifiable		0.65%	3.2	Visual
204	Car seal missing, unsealed or improperly positioned		0.65%	3.2	Visual

NOTES:

SARPA-QA FORM 2567 FEB 74 4810

4.4.3 Testing -

4.4.3.1 Chemical Composition and Stability and Physical Tests (See 3.2 and 3.5) - Ten (10) pounds of propellant shall be selected at random from each lot. Five (5) pounds shall be provided for chemical and stability tests. The remaining five (5) pounds shall be forwarded to the installation designated by the procuring activity for 65.5°C surveillance tests. All samples shall be packed in airtight containers and shall be marked to show the propellant designation, lot number, manufacturer, date of sampling, contract number and number of pounds in the lot.

4.4.3.2 Form and Dimensions of Grain (See 3.6 and 3.7) - Sixty (60) grains of propellant shall be selected at random from each lot for examination.

4.4.3.3 Ballistic (See 3.8) - Sufficient propellant to load thirty (3) sample rounds shall be selected at random from each lot for this test at a Government proving ground.

4.4.3.4 Rejection - A lot shall be considered acceptable if it meets the requirements of Section 3. If a lot does not meet the ballistic and stability and physical requirements, it shall be rejected; but with the approval of the procuring activity it may be retested.

4.5 Test Methods and Procedures -

4.5.1 Determination of Composition - Test methods specified below are in accordance with Military Standard MIL-STD-286.

4.5.1.1 Nitrocellulose - The percentage of nitrocellulose shall be determined as specified in Method 209.2

4.5.1.2 Nitroglycerin - The percentage of nitroglycerin shall be determined as specified in Method 208.1, using methylene chloride as the solvent for extraction.

4.5.1.3 Potassium Nitrate - The percentage of potassium nitrate shall be determined as specified in Method 310.4.

4.5.1.4 Barium Nitrate - The percentage of barium nitrate shall be determined as specified in Method 304.1.

4.5.1.5 Ethyl Centralite - The percentage of ethyl centralite shall be determined as specified in Method 202.2, using methylene chloride as the solvent for extraction.

4.5.1.6 Graphite - The percentage of graphite shall be determined as specified in Method 308.1.

4.5.2 Total Volatiles - The total volatiles content shall be determined as specified in Method 103.3, MIL-STD-286.

4.5.3 Total Moisture - The total moisture content shall be determined as specified in Method 102.1, MIL-STD-286.

4.5.4 120°C Heat Test - The 120°C heat test shall be conducted as specified in Method 404.1, MIL-STD-286.

4.5.5 Dimensional Tests -

4.5.5.1 Form of Grain - Determine the form of grain by visual examination.

4.5.5.2 Length - Determined as specified in Method 504.1.

4.5.5.3 Grain Diameter, Perforation and Web Thickness - Determined as specified in Method 504.1.

4.5.5.4 Length-diameter Ratio - See Method 504.1.

4.5.5.5 Grain Diameter-perforation Diameter Ratio - See Method 504.1.

4.5.5.6 Length and Diameter Uniformity - From the measurements of length and grain diameter made as specified in 4.5.5.2 and 4.5.5.3, calculate the standard deviation of the individual dimensions expressed as a percentage of the mean dimension.

4.5.6 Ballistic -

4.5.6.1 Closed Bomb - The propellant shall be fired in a 200cc nominal bomb at a loading density of 0.1 gm/cc. A closed bomb quickness match shall be made to the current standard lot.

The quickness match is defined as a minimum quickness of 97 per cent and maximum of 103 percent when fired in a closed bomb. The test shall be either conducted by the Government or by the contractor, provided the Government as stipulated in the contract or order, approves the equipment and test methods to be used by the contractor prior to manufacturing.

5. PREPARATION FOR DELIVERY

5.1 Packing -

5.1.1 Level A - Propellant procured under this specification shall be packed in boxes conforming to MIL-STD-652, Drawing 8858848. Immediately prior to packing, all containers shall be tested with compressed air in accordance with MIL-STD-652 and Drawing 8858848.

5.2 Marking - The containers shall be marked in accordance with MIL-STD-652, Drawing 8858848 and Code of Federal Regulations, Title 49, Parts 100-199.

6. NOTES

6.1 Intended Use - The component covered by this specification is intended for use with M5 submission ammunition.

6.2 Ordering Data - See MIL-A-48078.

6.3 Submission of Inspection Equipment Designs for Approval - See MIL-A-48078. Submit equipment designs as required to Commander, Attn: SARPA-QA-T, Picatinny Arsenal, Dover, N. J. 07801.

6.4 Submission of Results of Contractor-conducted Examinations and Tests - Data shall be submitted in accordance with data item DI-R-1721 on the DD Form 1423 for the contract.

6.5 The 65.5°C surveillance tests are for information only.

6.6 The propellant shall be matched to the current standard lot approved by the Contracting Officer.

Custodian:
Army-PA

Preparing Activity:
Army-PA

Project Number: 1375-A163

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*

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